Reply To Examiner's Remarks

Claims 1, 3-4, 6 and 9-12, as amended, are presented for consideration. Claims 2, 5, 7-8 and13-47 are canceled.

The Examiner objects to claims 6 and 9, noting that the phrase "said first sub-layer" was not underlined to indicate addition of this phrase to claims 6 and 9. In claims 1, 6 and 9, the phrases "first sub-layer" and "second sub-layer" are replaced by the phrases "first layer" and "second layer," respectively, to respond to this and other objections and rejections by the Examiner.

The Examiner objects to claims 6, noting that the new phrase "said first sub-layer" appearing therein was not underlined. Claim 6, as amended herein, now recites

"The composite structure of claim 1, wherein said first layer comprises between 10 percent and 65 percent tantalum disilicide, at least 5 percent molybdenum disilicide and between 20 percent and 45 percent borosilicate glass."

The Examiner rejects claim 9 under 35 U.S.C. 112, second paragraph, noting that a word appears to be missing after the word "together" in line 2. Claim 9, as amended herein, now recites

"The composite structure of claim [[8]] 1, wherein said first ~~sub-~~layer ~~and said second sub-layer together~~ material impregnates said substrate to a depth of approximately 0.1 inches."

The Examiner rejects claims 11 and 12 under 35 U.S.C. 112, second paragraph, noting that these claims have insufficient antecedent basis for use of the phrase "said coating." Claims 11 and 12 are amended herein to replace "said coating" by "said second layer," for which support is found in paragraphs 0032 and 0033.

The Examiner rejects claims 1, 3-4, 6 and 9-12 under 35 U.S.C. 112, first paragraph, asserting that phrases such as "the second sub-layer impregnates the first sub-layer" and "wherein the first, second and third percentages are chosen so that the coefficient of thermal expansion of the first sub-layer is substantially the same as the substrate coefficient of thermal expansion, and wherein the fourth, fifth and sixth percentages are chosen to provide a protective layer, when exposed to temperatures up to at least 3000 °F and are chosen to provide a coefficient of thermal expansion for the second sub-layer for which the thermal expansion coefficient difference for the first sub-layer is smaller than the coefficients of thermal expansion for the first sub-layer and for the second sub-layer" cannot be located. The Examiner asserts that these phrases introduce new matter in the claims.

Claim 1 is amended herein to recite

"A composite structure, comprising:

a porous substrate comprising a selected substrate material and having a substrate coefficient of thermal expansion;

a first layer integrated with an exposed surface of the substrate, wherein the first layer material comprises between 5 percent and 70 percent tantalum disilicide, between 1 percent and 30 percent molybdenum disilicide, and between 10 percent and 95 percent borosilicate glass , and a second layer of material, with the first layer being positioned adjacent to and between the substrate exposed surface and a second layer with material composition different from the first layer, the second layer, with the first and second layers and the substrate forming a functionally gradient system that gradually transitions from a first composition in the substrate to a second composition in the first layer and from the second composition in the first layer to a third composition in the second layer;

wherein the first layer material comprises a first non-zero percentage of tantalum disilicide, a second non-zero percentage of molybdenum disilicide and a third non-zero percentage of borosilicate glass, the second layer material comprises a fourth non-zero percentage of tantalum disilicide, a fifth non-zero percentage of molybdenum disilicide and a sixth non-zero percentage of borosilicate glass, and

wherein the first, second and third percentages are chosen so that a coefficient of thermal expansion of the first layer is substantially the same as the substrate coefficient of thermal expansion, and

wherein the fourth, fifth and sixth percentages are chosen to provide a protective layer when exposed to temperatures up to at least 3000 °F and are chosen to provide a coefficient of thermal expansion for the second layer for which the thermal expansion coefficient difference for the functional gradient first layer and second layer is smaller than a difference that would be present between the coefficients of thermal expansion for the first layer and for the second layer in the absence of the functional gradient first layer and second layer."

Paragraph 0012 of the specification discloses use of a porous substrate and of a sub-layer, including molybdenum disilicide, silicon hexaboride and borosilicate glass, which forms a functionally gradient layer that transitions from a material that is substantially the composition of a substrate to a material that is substantially the composition of a first layer. Examples 1, 2, 4, 5, 6, 8 and 9, discussed in paragraphs 0037, 0038, 0040, 0041, 0042, 0044 and 0045, respectively) also disclose use of a first (sub-)layer. This sub-layer is the "first layer" (formerly the "first sub-layer") referred to in claims 1, 6 and 9.

Paragraph 0012 also discloses a second layer, applied to the (first) sub-layer, which contains tantalum disilicide, molybdenum disilicide, silicon hexaboride and borosilicate glass. The layer 1/layer 2 interface also has a functional gradient.

Paragraphs 0028, 0044 and 0045 also disclose provision of a functionally gradient layer adjacent to the (first) sub-layer and containing tantalum disilicide, molybdenum disilicide, silicon hexaboride and borosilicate glass, which refers implicitly to the second layer.

The Applicants believe that, with the changes made in the claims 1, 6 and 9 to refer to first and second layers, rather than to first and second sub-layers, the language in paragraphs 0012, 0028, 0037, 0038, 0040, 0041, 0042, 0044 and 0045 provides adequate support for, and connection to, the references to the "first layer" and to the "second layer" in claims 1, 6 and 9, as amended. The Applicants will make further changes to the language in claim 1, if required by the Examiner to clarify the relationship of the substrate and the first and second layers.

Respectfully Submitted,

John Schipper

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John Schipper

Patent representative for Applicants